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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,608	11/18/2003	Young-Jin Kim	8021-171 (SS-18218-US)	4859

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EXAMINER	
LE, NHAN T	
ART UNIT	**PAPER NUMBER**
2618	

DATE MAILED: 03/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/715,608	KIM, YOUNG-JIN	
	Examiner	Art Unit	
	Nhan T. Le	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05/28/04, 02/24/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. <u>Claims 1-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al (US 5,488,629) in view of Lin et al (US 2004/0038649)</u>.

As to claims 1, 28, Takahashi teaches a direct conversion receiver comprising: a filter (see fig. 5, numbers 61, 62, col. 15, lines 34-58) that generates an in-phase differential signal and a quadrature-phase differential signal derived from a received radio frequency (RF) signal; an in-phase mixer (see fig. 5, number 41, lines 59-67, col.16, lines 1-17) which mixes the in-phase differential signal with a first local oscillation signal and a second local oscillation signal; a quadrature-phase mixer (see fig. 5, number 42, lines 59-67, col .16, lines 1-17) which mixes the quadrature-phase differential signal with the first local oscillation signal and a third local oscillation signal. Takahashi fails to teach a mismatch estimation unit that estimates a phase mismatch of the in-phase mixer and the quadrature-phase mixer, from output signals of the in-phase mixer and the quadrature-phase mixer, for adjusting at least one of the phase mismatch of the in-phase mixer and the quadrature-phase mixer, in response to an output signal of the mismatch estimation unit. Lin teaches a mismatch estimation unit (see fig. 1, number 206, paragraphs 0040-0042) that estimates a phase mismatch of the in-phase

mixer and the quadrature-phase mixer, from output signals of the in-phase mixer and the quadrature-phase mixer, for adjusting at least one of the phase mismatch of the in-phase mixer and the quadrature-phase mixer, in response to an output signal of the mismatch estimation unit. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teaching of Lin into the system of Takahashi in order to avoid the imbalance in the in-phase or quadrature phase path of the base-band signal (as suggested by Lin paragraph 0041).

As to claim 2, the combination of Takahashi and Lin teaches wherein the phase mismatch of the in-phase mixer and the quadrature-phase mixer varies in response to the output signal of the mismatch estimation unit (see Lin paragraphs 0040-0041).

As to claim 3, the combination of Takahashi and Lin teaches wherein the in-phase mixer comprises a first mixer (see Takahashi fig. 5, number 41, col. 15, lines 59-67, col. 16, lines 1-10) which mixes the in-phase differential signal with the first local oscillation signal, and a second mixer (see Takahashi fig. 5, number 41, col. 15, lines 59-67, col. 16, lines 1-10) which mixes the in-phase differential signal with the second local oscillation signal; and the quadrature-phase mixer comprises a third mixer (see Takahashi fig. 5, number 42, col. 15, lines 59-67, col. 16, lines 1-10) which mixes the quadrature-phase differential signal with the first local oscillation signal, and a fourth mixer (see Takahashi fig. 5, number 42, col. 15, lines 59-67, col. 16, lines 1-10) which mixes the quadrature-phase differential signal with the third local oscillation signal, and the second local oscillation signal and the first local oscillation signal have a phase difference of 90 degree plus a first variable phase calibration factor, and the third local

oscillation signal and the first local oscillation signal have a phase difference of 90 degree plus a second variable phase calibration factor.

As to claim 4, the combination of Takahashi and Lin teaches wherein the first variable phase calibration factor and the second variable phase calibration factor have opposite signs and the same absolute value (see Lin paragraph 0042).

As to claim 5, the combination of Takahashi and Lin teaches wherein the in-phase mixer further comprises a 90 degree phase shifter (see fig. 5, number 52, col. 15, lines 40-58) , that phase shifts the first local oscillation signal and outputs a signal, and a first variable phase shifter for shifting the output signal of the 90 degree phase shifter by the first variable phase calibration factor and generates the second local oscillation signal; and the quadrature-phase mixer (see Takahashi fig. 5, number 52, col. 15, lines 40-58) further comprises a second variable phase shifter for shifting the output signal of the 90 degree phase shifter by the second variable phase calibration factor and thereby generates the third local oscillation signal.

As to claim 6, the combination of Takahashi and Lin teaches a subtracter (see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that subtracts an output signal of the fourth mixer from an output signal of the first mixer and generates an I-path signal; an adder (see Takahashi fig. 5, number 51, col. 8, lines 58-67, col. 9, lines 1-33) that adds an output signal of the second mixer and an output signal of the third mixer and generates a Q-path signal; and wherein the mismatch estimation unit (see Lin fig. 1, number 206, paragraphs 0040-0042) outputs a mismatch signal that is a

result of adding a signal obtained by squaring the I-path signal and a signal obtained by squaring the Q-path signal.

As to claim 7, the combination of Takahashi and Lin teaches wherein the mismatch estimation unit comprises: a first square unit (see Takahashi fig. 5, number 91, lines 15, lines 40-58) which squares the I-path signal; a second square unit see Takahashi fig. 5, number 92, lines 15, lines 40-58) which squares the Q-path signal; and an adder (see Takahashi fig. 5, number 620, col. 15, lines 40-58) that adds the output signals of the first and second square units.

As to claim 8, the combination of Takahashi and Lin teaches wherein at least one of the first variable phase calibration factor and the second variable phase calibration factor varies in response to the signal output from the mismatch estimation unit (see Lin paragraphs 0040-0042).

As to claim 9, Takahashi teaches a direct conversion receiver comprising: a filter (see fig. 5, numbers 61, 62, col. 15, lines 34-58) that generates an in-phase differential signal and a quadrature-phase differential signal derived from a received radio frequency (RF) signal; an in-phase mixer (see fig. 5, number 41, lines 59-67, col.16, lines 1-17) which mixes the in-phase differential signal with a first local oscillation signal and a second local oscillation signal; a quadrature-phase mixer (see fig. 5, number 42, lines 59-67, col .16, lines 1-17) which mixes the quadrature-phase differential signal with the first local oscillation signal and a third local oscillation signal. Takahashi fails to teach a mismatch estimation unit that estimates a gain mismatch of the in-phase mixer and the quadrature-phase mixer, from output signals of the in-phase mixer and the

quadrature-phase mixer, for adjusting the gain mismatch of the in-phase mixer and the quadrature-phase mixer, in response to an output signal of the mismatch estimation unit. Lin teaches a mismatch estimation unit (see fig. 1, number 206, paragraphs 0040-0042) that estimates a gain mismatch of the in-phase mixer and the quadrature-phase mixer, from output signals of the in-phase mixer and the quadrature-phase mixer, for adjusting the gain mismatch of the in-phase mixer and the quadrature-phase mixer, in response to an output signal of the mismatch estimation unit. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teaching of Lin into the system of Takahashi in order to avoid the imbalance in the in-phase or quadrature phase path of the base-band signal (as suggested by Lin paragraph 0041).

As to claim 10, the claim is rejected as claim 2 above.

As to claim 11, the claim is rejected as claim 3 above.

As to claims 12, 13, the claim is rejected as claim 10 above.

As to claim 14, the claim is rejected as claim 6 above.

As to claim 15, the combination of Takahashi and Lin teaches wherein the gain mismatch of the filter is calibrated for in response to an output signal of the mismatch estimation unit (see Lin paragraphs 0040-0042).

As to claim 16, Takahashi teaches direct conversion receiver comprising a filter (see fig. 5, numbers 61, 62, col. 15, lines 34-58) that generates an in-phase differential signal and a quadrature-phase differential signal derived from a received radio frequency (RF) signal; a differential signal adder (see Takahashi fig. 5, number 51, col.

8, lines 58-67, col. 9, lines 1-33) that adds the in-phase differential signal and the quadrature-phase differential signal, and generates an added differential signal; a differential signal subtracter (see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that subtracts the quadrature-phase differential signal from the in-phase differential signal, and generates a subtracted differential signal; a mixer unit (see fig. 5, numbers 41, 42, lines 59-67, col.16, lines 1-17) that mixes the added differential signal with a first local oscillation signal and mixes the subtracted differential signal with a second local oscillation signal. Takahashi fails to teach a mismatch estimation unit for estimating a phase mismatch from signals output from the mixer unit, for adjusting the phase mismatch of the mixer unit in response to an output signal of the mismatch estimation unit. Lin teaches a mismatch estimation unit (see fig. 1, number 206, paragraphs 0040-0042) for estimating a phase mismatch from signals output from the mixer unit, for adjusting the phase mismatch of the mixer unit in response to an output signal of the mismatch estimation unit. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teaching of Lin into the system of Takahashi in order to avoid the imbalance in the in-phase or quadrature phase path of the base-band signal (as suggested by Lin paragraph 0041).

As to claims 17, 18, 19, the combination of Takahashi and Lin teaches wherein the mixer unit comprises: a first mixer (see fig. 5, number 41, lines 59-67, col.16, lines 1-17) that mixes the added differential signal with the first local oscillation signal; and a second mixer (see Takahashi fig. 5, number 42, lines 59-67, col.16, lines 1-17) that mixes the subtracted differential signal with the second local oscillation signal, wherein

the phase of the second local oscillation signal and the first local oscillation signal have a phase difference of 90 degree plus a variable phase correction factor (see Takahashi fig. 5, number 52, col. 15, lines 40-58) that varies in response to the output signal of the mismatch estimation unit and wherein the phase of the second local oscillation signal and the first local oscillation signal have a phase difference of 90 degree, and the phase mismatch of the filter varies in response to the output signal of the mismatch estimation unit (see Lin paragraphs 0040-0042).

As to claim 20, the combination of Takahashi and Lin teaches wherein the mismatch estimation unit comprises a first adder (see Takahashi fig. 5, number 51, col. 8, lines 58-67, col. 9, lines 1-33) that adds the output signal of the first mixer and an output signal of the second mixer; a third mixer (see Takahashi fig. 5, number 41, col. 8, lines 58-67, col. 9, lines 1-33) that mixes a signal output by the first adder with a third local oscillation signal; a fourth mixer (see Takahashi fig. 5, number 42, col. 8, lines 58-67, col. 9, lines 1-33) that mixes a signal output by the first adder, with a fourth local oscillation signal; first and second square units (see Takahashi fig. 5, numbers 91, 92, col. 8, lines 58-67, col. 9, lines 1-33) which square output signals of the third mixer and the fourth mixer, respectively; and a second adder see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that adds output signals of the first and second square units.

As to claim 21, the combination of Takahashi and Lin teaches wherein the mismatch estimation unit comprises: a phase shifter see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that generates a first output signal and a second

output signal having a phase difference of 90 degree, from a signal obtained by adding output signals of the first mixer and the second mixer; first and second square units (see Takahashi fig. 5, numbers 91, 92, col. 8, lines 58-67, col. 9, lines 1-33) which square the first output signal and the second output signal, respectively; and a mismatch estimation unit adder that adds output signals of the first and second square units (see Takahashi fig. 5, number 620, col. 8, lines 58-67, col. 9, lines 1-33, Lin paragraph 0040-0042).

As to claim 22, Takahashi teaches direct conversion receiver comprising: a filter (see fig. 5, numbers 61, 62, col. 15, lines 34-58) that generates an in-phase differential signal and a quadrature-phase differential signal derived from a received radio frequency (RF) signal; a differential signal adder (see Takahashi fig. 5, number 51, col. 8, lines 58-67, col. 9, lines 1-33) that adds the in-phase differential signal and the quadrature-phase differential signal, and generates an added differential signal; a differential signal subtracter (see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that subtracts the quadrature-phase differential signal from the in-phase differential signal, and generates a subtracted differential signal; a mixer unit (see fig. 5, number 600, col. 15, lines 40-58, col. 16, lines 42-55) that mixes the added differential signal with a first local oscillation signal and mixes the subtracted differential signal with a second local oscillation signal. Takahashi fails to teach a mismatch estimation unit for estimating a DCR gain mismatch from signals output from the mixer unit, for adjusting the gain mismatch of the mixer unit in response to an output signal of the mismatch estimation unit. Lin teaches a mismatch estimation unit (see fig. 1, number 206, paragraphs 0040-0042) for estimating a DCR gain mismatch from signals output from

the mixer unit, for adjusting the gain mismatch of the mixer unit in response to an output signal of the mismatch estimation unit. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teaching of Lin into the system of Takahashi in order to avoid the imbalance in the in-phase or quadrature phase path of the base-band signal (as suggested by Lin paragraph 0041).

As to claims 23, 24, 25, the claims are rejected as claims 17, 18, 19 above.

As to claim 26, the combination of Takahashi and Lin teaches wherein the mismatch estimation unit comprises a third mixer (see fig. 5, number 41, col. 15, lines 40-58, col. 16, lines 42-55) which mixes a signal obtained by adding an output signal of the first mixer and an output signal of the second mixer, with a third local oscillation signal; a fourth mixer (see fig. 5, number 42, col. 15, lines 40-58, col. 16, lines 42-55) which mixes a signal obtained by adding the output signal of the first mixer and the output signal of the second mixer, with a fourth local oscillation signal; square units (see Takahashi fig. 5, numbers 91, 92, col. 8, lines 58-67, col. 9, lines 1-33) which square output signals of the third mixer and the fourth mixer, respectively; and a mismatch estimation unit adder (see Takahashi fig. 5, number 620, col. 8, lines 58-67, col. 9, lines 1-33) that adds output signals of the square units .

As to claim 27, the combination of Takahashi and Lin teaches wherein the mismatch estimation unit comprises a phase-shifting signal splitter (see Takahashi fig. 5, number 52, col. 8, lines 58-67, col. 9, lines 1-33) that generates a first output signal and a second output signal having a phase difference of 90 degree, derived from a signal obtained by adding output signals of the first mixer and the second mixer; square

units (see Takahashi fig. 5, numbers 91, 92, col. 8, lines 58-67, col. 9, lines 1-33) which square the first output signal and the second output signal, respectively; and a mismatch estimation unit adder (see Takahashi fig. 5, number 620, col. 8, lines 58-67, col. 9, lines 1-33) that adds output signals of the square units, wherein the gain of the variable gain adjuster or the gain mismatch of the poly-phase filter varies so that a value that is obtained by low pass filtering an output of the mismatch estimation unit adder is minimized.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ali (US 6,590,943) teaches radio receiver.

Shen (US 2004/0116096) teaches radio frequency receiver architecture with tracking image reject polyphase filter.

Loper (US 5,249,203) teaches phase and gain error control system for use in I/Q direct conversion receiver.

Loper (US 5,095,536) teaches direct conversion receiver with triphase architecture.

Loper (US 5,179,730) teaches selectivity system for direct conversion receiver.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhan T. Le whose telephone number is 571-272-7892. The examiner can normally be reached on 08:00-05:00 (Mon-Fri).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nhan Le

Nguyen Vo
3_15_2006

NGUYEN T. VO
PRIMARY EXAMINER